Claims

1. A waste water treatment plant including:-

a treatment chamber containing a plurality of sludge carrier elements, and, in a lower part thereof a bio-film collection region for receiving in use bio-film from said sludge carrier elements;

an outlet for delivering waste water into an upper part of said treatment chamber;

a settlement chamber in flow communication at its lower end with said treatment chamber, whereby in use water may flow from said treatment chamber via said bio-film collection region to said settlement chamber;

a generally vertical column disposed in said treatment chamber and having an upper end which projects above the liquid surface in use, and a lower region in flow communication with said treatment chamber, and

air delivery means for introducing air or other gas into a lower region of said column in use to aerate the liquid therein and to cause the liquid to flow upwardly to overflow into said treatment chamber.

2. A waste water treatment plant according to Claim 1 wherein the air delivery means comprises a nozzle designed to create a large number of microbubbles which saturate the liquid with air and simultaneously force the sewage in the water to the surface.

3. A waste water treatment plant according to Claim 1 or Claim 2, wherein a screen element is provided at the upper end of said treatment chamber to keep the sludge carrier elements within said treatment chamber.

4. A waste water treatment plant according to any of the preceding Claims, wherein a screen element is provided to separate the main part of the treatment chamber from the bio-film collection region to prevent the sludge carrier elements entering the bio-film collection region.

5. A waste water treatment plant according to any of the preceding claims, wherein the sludge carrier elements are made of a material having a specific gravity less than one so that they are generally buoyant in the water.

6. A waste water treatment plant according to any of the preceding claims, wherein the sludge carrier elements may be made of plastics material.

7. A waste water treatment plant according to any of the preceding claims, wherein the sludge carrier elements are of generally uniform size.

8. A waste water treatment plant according to Claim 7, wherein the sludge carrier elements are generally spherical with a central bore passing from one side to the other.

9. A waste water treatment plant according to Claim 8, wherein the inner and/or outer surfaces of the sludge carrier elements are textured or patterned to provide an extended surface area.

10. A waste water treatment plant according to Claim 9, wherein the inner and/or outer surfaces may be corrugated to provide ribs or wings.

11. A waste water treatment plant according to any of the preceding Claims, wherein the settlement tank has an outlet for purified water towards its upper end.

12. A waste water treatment plant according to any of the preceding claims, wherein the treatment chamber is generally cylindrical, and said vertical column is located co-axially within the treatment chamber.

13. A waste water treatment plant according to Claim 12, wherein the settlement chamber is of annular form encircling the treatment chamber.

14. A waste water treatment plant according to Claim 13, wherein aeration means are provided in the lower part of the settlement chamber, with the settlement chamber being in flow communication at its lower end with a further settlement chamber.

15. A waste water treatment plant according to Claim 14, wherein the further settlement chamber is of annular form generally surrounding the first-mentioned settlement chamber.

16. A sludge carrier element of generally spherical form with a central bore passing from one side to the other.

17. A water treatment plant including a plurality of sludge carrier elements according to Claim 16.